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### ORIGINAL ARTICLE

# The impact of “*Ramadan fasting period*” on total and differential white blood cells, haematological indices, inflammatory biomarker, respiratory symptoms and pulmonary function tests of healthy and asthmatic patients



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#### KEYWORDS

Ramadan fasting;  
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Respiratory symptoms;  
Pulmonary function test;  
Inflammatory mediator

#### Abstract

**Background:** There is no conclusive evidence regarding the effect of fasting on different features in asthmatic patients. In the present study, the effect of Ramadan fasting in asthmatic patients and healthy control was studied.

**Methods:** Haematological indices, inflammatory mediators, pulmonary function tests (PFT) and respiratory symptoms were evaluated in 15 asthmatic patients compared to 14 healthy matched control group before and after the one-month fasting period in Ramadan. The change in each parameter from the beginning to the end of Ramadan was calculated and referred to as “variation during Ramadan”.

**Results:** The values of MCH, MCHC in both groups and monocyte counts in asthmatic patients, were significantly increased but platelet count was reduced in asthmatic and controls respectively compared to pre-Ramadan fasting period ( $P < 0.05$  to  $0.001$ ). Serum hs-CRP level in control and asthmatic groups was significantly reduced after Ramadan fasting month ( $P < 0.001$  for both groups). PFT values after Ramadan fasting month in both groups were non-significantly higher compared to pre-fasting values except FVC. Respiratory symptoms in asthmatic patients were non-significantly but wheeze-o was significantly reduced after Ramadan fasting period in asthma group ( $P < 0.05$ ). There was no significant difference in variations of different parameters during Ramadan fasting period between two groups, although reduction of hs-CRP in asthmatic group was non-significantly higher than control group.

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**Conclusion:** These results show that Ramadan fasting period has no negative impact on asthma and may have some positive effect on asthma severity with regard to reduction of hs-CRP concentration and chest wheeze.

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## Background

The holy Ramadan is the 9th month of the lunar calendar (*Hejri*), including 29–30 days. Ramadan has importance and great social value among Muslims all over the world that restrict them from some tasks consisting of drinking, eating, smoking, and sexual relationships, from pre sun rise (*Sahar*) to post sun set (*Iftar*).<sup>1,2</sup> Because the duration of the lunar year (354 days) is lower than the Gregorian year (365 days), fasting time is variable<sup>3</sup> from 12 to 18 h and even 22 h each day, depending on the geographical area, season and country; the end of spring, beginning of summer, the tropics and temperate locations being longer.<sup>4,5</sup> However, in some conditions Muslims are exempt from fasting including; travelling, pregnancy, menstruation, breast-feeding women, patients given medication via oral and parenteral, sickness, pre-pubertal and pubertal children.<sup>6,7</sup> Nevertheless, medicines used through breathing and inhalation route do not cancel this duty.

Asthma is a chronic and one of the most common respiratory diseases. Based on the Global Initiative for Asthma (GINA) report, the number of people who are suffering from asthma is more than 300 million.<sup>8</sup> Likewise, according to the Iranian Asthma Society, the prevalence of asthma in the Iranian population is estimated to be about 8–12%,<sup>9</sup> while in Mashhad and Isfahan, two large cities of Iran, it was reported as 2.8% of total population<sup>10</sup> and 7.3% of high school children,<sup>11</sup> respectively. Asthma is a complex respiratory condition with inflammation, hyper responsiveness, obstruction and remodelling of the airways. The nature of airway obstruction in asthma is fully or partially reversible.<sup>12</sup>

All guidelines for treatment of asthma suggest orderly use of medicines for relieving symptoms and prevention of development of disease, such as monitoring and education of patients as well as avoiding of risk factors. Correlation between health and various religious rituals is an important issue, but only limited, inadequate or controversial studies are available in this regard.<sup>2</sup>

The effect of one month fasting during Ramadan on various aspect of asthma was examined in several previous studies. Increased peak expiratory flow (PEF) due to one month fasting in asthmatic patients<sup>13</sup> as well as maximal expiratory flow at 75% and 75–85% of vital capacity (MEF<sub>75</sub>, MEF<sub>75–85</sub> respectively) in healthy subjects<sup>14</sup> was shown previously. However, the absence of the effect of fasting in Ramadan on PFT values in asthmatic patients was demonstrated in another study.<sup>15</sup> The effect of fasting and decrease in food intake on weight loss can decrease the constriction of airways,<sup>16</sup> lead to changes in surfactant and elastin metabolism,<sup>17</sup> increase in catecholamine which can cause airway dilation, as well as decreasing stomach volume and gastro oesophageal reflux<sup>18</sup> all postulated as the possible mechanisms of fasting on asthmatic patients and PFT

values. However, a change in circulating inflammatory mediators could be another possible mechanism responsible for the effect of one month fasting in Ramadan on asthmatic patients and PFT values.

Therefore, in the present study, the impact of Ramadan fasting period on respiratory symptoms, pulmonary function tests (PFT), haematological indices, total and differential white blood cells and inflammatory biomarkers on healthy and asthma subjects were examined.

## Material and methods

### Subjects

Fourteen healthy volunteers (mean age  $\pm$  SD; 37.5  $\pm$  7.86 year, mean height  $\pm$  SD; 175.66  $\pm$  12.11 cm) and fifteen asthmatic patients (mean age  $\pm$  SD; 49.28  $\pm$  12.54 year, mean height  $\pm$  SD; 166.38  $\pm$  8.66 cm) with moderate to severe disease according to GINA guideline<sup>19</sup> were studied with the following inclusion and exclusion criteria: (1) previously diagnosed with asthma by a physician; (2) two or more of the following symptoms: recurrent wheeze, cough or chest-tightness at rest; nocturnal or early morning wheeze, cough or chest-tightness; and wheeze or cough during exercise, (3) FEV1 and PEF less than 80% predicted values; (4) no history or symptoms of cardiovascular or other respiratory diseases that required treatment (excluding the common cold). Control subjects were healthy volunteers and had no history of respiratory complaints. Excluding criteria were: recent respiratory infection, chest X-ray (CXR) abnormality, smoking, high blood pressure and diabetes. Patients received their regular medications during the study period. The study was approved by the Ethical Committee of the Mashhad University of Medical Sciences (Code: 930520), and all subjects gave informed consent.

### Blood sampling and assessment of haematological parameters

Ten millilitres of blood was collected from each control and asthma subject twice: (1) three to five days before and (2) after the end of Ramadan.

High sensitivity C-reactive protein (hs-CRP), an index of inflammation, was quantified using commercially available specific Enzyme Linked Immune Absorbent Assays (ELISA) according to the manufacturer's protocol (Antibodies-online; Catalog Number: ABIN366539).

Total red blood cell (RBC) and white blood cells (WBC) were counted in duplicate in a haemocytometer (in a Burkner chamber) in blood stained with Turk solution (1:10 dilution, consisting of 1 ml of glacial acetic acid, 1 ml of gentian violet solution 1% and 100 ml distilled).

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